Claims

1. A chemical compound comprising a chemical moiety (p) capable of performing a binding interaction with a target molecule and further comprising an oligonucleotide (b) or functional analogue thereof, **characterized in that** the oligonucleotide (b) or functional analogue comprises at least one self-assembly sequence (b1) capable of performing a combination reaction with at least one self-assembly sequence (b1') of a complementary oligonucleotide or functional analogue bound to another chemical compound comprising a chemical moiety (q).

2. The chemical compound of claim 1, **characterized in that** the oligonucleotide (b) or functional analogue thereof further comprises a sequence tag (b2) coding for the identification of the chemical moiety (p).

3. A chemical compound comprising a chemical moiety (p) capable of performing a binding interaction with a target molecule and further comprising an oligonucleotide (b) or functional analogue thereof, which comprises a coding sequence (b1) coding for the identification of the chemical moiety (p), **characterized in that** the chemical compound further comprises at least one self-assembly moiety (m) capable of performing a combination reaction with at least one self-assembly moiety (m') of a similar chemical compound comprising a chemical moiety (q).

4. The chemical compound of claim 3, **characterized in that** the self-assembly moiety (m) is a self-assembly sequence (b1) of the oligonucleotide (b), a functional analogue thereof, a ligand (l) capable to perform a complex reaction with a specific ion, or a peptide capable of association with other molecules.

5. The chemical compound of one of claims 1 to 4, **characterized in that** the oligonucleotide (b) or functional analogue thereof is directly linked to chemical moiety (p).

6. The chemical compound of one of claims 1 to 5, **characterized in that** the oligonucleotide (b) or functional analogue thereof further comprises a linking portion (b3) which is situated between the self-assembly sequence (b1) and the chemical moiety (p).

7. The chemical compound of one of claims 2 or 5, **characterized in that** the coding sequence (b2) of oligonucleotide (b) or the functional analogue thereof is situated between the chemical moiety (p) and the self-assembly sequence (b1).

8. The chemical compound of one of claims 1, 2 or 4 to 7, **characterized in that** the at least one self-assembly sequence (b1) is capable of performing a combination reaction with the self-assembly sequences (b1') of two or more complementary oligonucleotides or functional analogues bound to other chemical compounds comprising a chemical moiety (q,r,s ...) in order to form oligomers like e.g. trimers or tetramers.

9. A library of chemical compounds comprising a chemical moiety (p) capable of performing a binding interaction with a target molecule (e.g. a biological target) and further comprising an oligonucleotide (b) or functional analogue thereof, **characterized in that** the oligonucleotide (b) or functional analogue comprises at least one self-assembly sequence (b1) capable of performing a combination reaction with a self-assembly sequence (b1') of a complementary oligonucleotide or functional analogue bound to another chemical compound comprising a chemical moiety (q).

10. A library of chemical compounds comprising a chemical moiety (p) capable of performing a binding interaction with a target molecule (e.g. a biological target) and further comprising an oligonucleotide (b) or functional analogue thereof, which comprises a coding sequence (b1) coding for the identification of the chemical moiety (p), **characterized in that** the chemical compound further comprises at least one self-assembly moiety (m) capable of performing a combination reaction with at least one self-assembly moiety (m') of a similar chemical compound comprising a chemical moiety (q).

11. The library of claim 10, **characterized in that** the self-assembly moiety (m) is a self-assembly sequence (b1) of the oligonucleotide (b), a functional analogue thereof, or a ligand (l) capable to perform a complex reaction with a specific ion (i).

12. The library according to one of claims 9 to 11, **characterized in that** it comprises chemical compounds according to any one of claims 2 or 5 to 8.

13. The library according to any of claims 9, 11 or 12, **characterized in that** its individual combinations of moieties (p,q,r,s ...) is derived by forming oligomers like e.g. trimers or tetramers, i.e. by heterooligomerization of the self-assembly sequences (b1,b1') of the oligonucleotide (b) forming heteroduplexes, heterotriplexes or heteroquadruplexes.

14. The library according to claim 10, **characterized in that** its individual combinations of moieties (p,q,r,s ...) is derived by chelation of the self-assembly moieties (m,m') with specific ions (i).

15. The library according to claim 13, **characterized in that** it comprises individually encoded sub-libraries (A) and (B), whereas sub-library (A) comprises **n** compounds coupled to the 3' extremity of **n** different DNA oligonucleotides (b) and sub-library (B) comprises **m** compounds coupled to the 5' extremity of **m** different DNA oligonucleotides (b').

16. The library according to claim 15, **characterized in that** in sub-library (A) or in sub-library (B) respectively, iodoacetamido- or maleido-derivatives of **n** or **m** chemical entities have been coupled to individual DNA oligonucleotides which carry a thiol group at the 3' or 5' end.

17. The library according to claim 15, **characterized in that** in sub-library (A) or in sub-library (B) respectively, amide derivatives - forming chemical structures such as $-O-P(O)_2-O-(CH_2)n-NH-CO-R$, where R may correspond to a number of different chemical entities, and n may range between 1 and

10 - have been coupled to the oligonucleotides carrying a phosphodiester bond at one extremity.

18. The library according to one of claims 15 to 17, **characterized in that** in sub-library (A) the self-assembly sequence (b1) is interrupted by a d-spacer in opposite position to a code (B), the d-spacer preventing any undesired pairing to the bases of code (B) which encodes sub-library (B), whereas the oligonucleotide (b) of sub-library (A) has its distinctive code (A) towards the 5' extremity.

19. A method of biopanning ligands specific for target molecules (e.g. biological targets), **characterized in that** a chemical compound comprising a chemical moiety (p) capable of performing a binding interaction with a target molecule and further comprising an oligonucleotide (b) or functional analogue thereof, wherein the oligonucleotide (b) or functional analogue comprises at least one self-assembly sequence (b1) capable of performing a combination reaction with at least one self-assembly sequence (b1') of a complementary oligonucleotide or functional analogue bound to another chemical compound comprising a chemical moiety (q) is incubated with a target molecule and the resulting complex of the target and a chemical compound is physically separated from chemical compounds which have not bound to the target.

20. The method of claim 19, **characterized in that** a chemical compound according to at least one of claims 1 to 8 is used for biopanning.

21. The method of claim 19 or 20, **characterized in that** a library of chemical compounds according to at least one of claims 9 to 18 is used for biopanning.

22. A method to identify a target molecule (e.g. a biological target) with a chemical compound comprising a chemical moiety (p) capable of performing a binding interaction with this target molecule and further comprising an oligonucleotide (b) or functional analogue thereof **characterized in that** the

chemical compound is bound to a target by biopanning according to at least one of claims 19 to 21.

23. The method of claim 22, **characterized in that** PCR-fragments are generated by polymerase chain reaction (PCR), each of which carries the code of pairs of sub-library members (A) and (B), whereas sub-library (A) comprises **n** compounds coupled to the 3' extremity of **n** different DNA oligonucleotides (b) and sub-library (B) comprises **m** compounds coupled to the 5' extremity of **m** different DNA oligonucleotides (b').

24. The method of claim 23, **characterized in that** in sub-library (A) or in sub-library (B) respectively, iodoacetamido- or maleido-derivatives of **n** or **m** chemical entities are coupled to individual DNA oligonucleotides which carry a thiol group at the 3' or 5' end.

25. The method of claim 24, **characterized in that** in sub-library (A) the self-assembly sequence (b1) is interrupted by a d-spacer in opposite position to a code (B), the d-spacer preventing any undesired pairing to the bases of code (B) which encodes sub-library (B), whereas the oligonucleotide (b) of sub-library (A) has its distinctive code (A) towards the 5' extremity.

26. The method of at least one of claims 22 to 25, **characterized in that** the length of the PCR-fragments are checked and their sequence identity is established by digesting the PCR-fragments with a restriction site for a specific endopeptidase (e.g. *Eco*RI), followed by cloning into a suitable plasmid and sequencing.

27. The method of at least one of claims 22 to 26 where several specific binding members are isolated at the end of a biopanning experiment, **characterized in that** concatenamers are created, starting from the various PCR-fragments present in the reaction mixture, the concatenated sequences are "read" by sequencing, revealing both the identity and the frequency of pairs of code (A) and code (B).

28. The method of claim 23 where several specific binding members are isolated at the end of a biopanning experiment and sub-libraries (A) and/or (B) carry chemical moieties at the extremities of partially-annealing oligonucleotides **characterized in that** unpaired DNA strands are hybridized with target oligonucleotides (e.g. DNA oligonucleotides) being immobilized on one or more chips.

29. The method of claim 28, **characterized in that** by using chip (A) or chip (B) respectively, the reading of the identity and/or frequency of members of sub-library (A) or sub-library (B) respectively, rescued after a biopanning experiment, is carried out and by decoding on chip (A) and (B) candidate components of sub-libraries (A) and (B), to be re-annealed and screened in a successive round of bio-panning are suggested.

30. The method of claim 29, **characterized in that** increasingly stringent binding to the target is mirrored by a reduction in the number of (A) and/or (B) members as identified on the respective chip and the possible combinations of the candidate (A) and (B) members are assembled individually or in smaller pools and assayed for binding to the target.

31. The method of at least one of the claims 28 to 30, **characterized in that** libraries are allowed to self-assemble in order to form trimeric or tetrameric complexes (e.g. using DNA triplexes or quadruplexes for the oligomerization of compounds) by using three or four chips, respectively, which carry distinctive target oligonucleotides for decoding.

32. The method of at least one of the claims 38 to 31, **characterized in that** the DNA of selected binding moieties is PCR amplified prior to chip hybridization.